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## TORTULA CAROLINIANA, NEW SPECIES

A. LE ROY ANDREWS

*Tortula caroliniana* n. sp.—Growing in extensive mats on the bark of trees. Stems somewhat matted below with radicles, with brown leaves, above simple, with bright green leaves, which readily become brown with age. Plants very short or sometimes more lengthened, up to about 1 cm. Stem in section round, with central strand; outer 2–3 rows of cells gradually smaller and thicker-walled than those within. Leaves obovate, normally about 2.5 mm. long, 1 mm. wide in widest part, borders strongly reflexed in basal  $\frac{1}{2}$ – $\frac{2}{3}$ , apex abruptly apiculate with costa only percurrent; costa slender, up to 50  $\mu$  in width in lower part of leaf, brown, smooth on back, in section with two guide-cells and two ventral cells nearly equally large adjoining them, dorsally of uniform stereid cells. Leaf-cells at base smooth, rectangular, the outer ones narrow and somewhat chlorophyllose, up to 50 x 10  $\mu$ , in region of costa larger, hyaline with brown walls, up to 70 x 25  $\mu$ ; cells of upper part of leaf irregularly roundish quadrate, with fairly thick walls and distinct trigones, averaging about 14  $\mu$  in diameter, in border region slightly smaller and with thicker walls, but not giving the impression of a distinct border, papillose on both surfaces, the papillae mostly crescent shaped,<sup>1</sup> 3  $\mu$  or less from end to end of the crescent, normally 4 per cell on either side, rarely more than 6, in smaller cells of border region often 2 or 3. Papillae rather low in profile and quite independent of each other, the wall to which they are attached not at all thickened, the outer wall of cell very slightly bulging.

Inflorescence and sporophyte not seen. Reproduction by means of very numerous propagula, more or less cylindrical in shape, with rounded ends, produced from ventral surface of upper half of leaf blade,<sup>2</sup> the cells from which they originate generally slightly smaller than those surrounding them, often lacking chlorophyll and with papillae less distinct or lacking. Propagula densely chlorophyllose, somewhat roughened on outer surface, divided by parallel planes at right angles to the axis of development at intervals of 20–25  $\mu$ , these divisions often further subdivided into 2 or 4 parts by planes at right angles, the subdivision of adjacent segments in this case not necessarily conformable, the end segments usually smaller and undivided. The number of primary divisions varies with the length of the propagulum all the way up to 8, which is sometimes but not often exceeded. The width of the propagulum varies up to about 45  $\mu$ , the length is entirely variable, extending up to 200  $\mu$  or more.

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<sup>1</sup>In the illustration they are represented as too irregular in shape and somewhat too large. Their shape is that of a perfectly regular crescent, except as they sometimes form a complete, but again perfectly regular ring. This last tendency is stronger on the dorsal surface and also increases with exposure of the plants to light and sun.

<sup>2</sup>In the illustration they are slightly flattened down by the cover-glass; when undisturbed they rise exactly perpendicular to the leaf-surface and are not at all confined to the immediate apex of the leaf. The costa is represented as too broad in the figure.

Found growing on bark of deciduous trees (beech, oak, chestnut), bank of Swannanoa River, at Swannanoa, Buncombe Co., July 9; North Fork, some 5 miles above its confluence with Swannanoa River, July 10; Grandmother Gap, Avery Co., Aug. 13; all in North Carolina, 1919.

Apparently specifically identical and to be provisionally referred to this species are specimens from Mexico: Etzatlan, Jalisco, Oct. 6, 1908 (*Pringle 10618*, in part); Cuernavaca, Morelos, Oct., 1908 (*Pringle 15308*, in part).

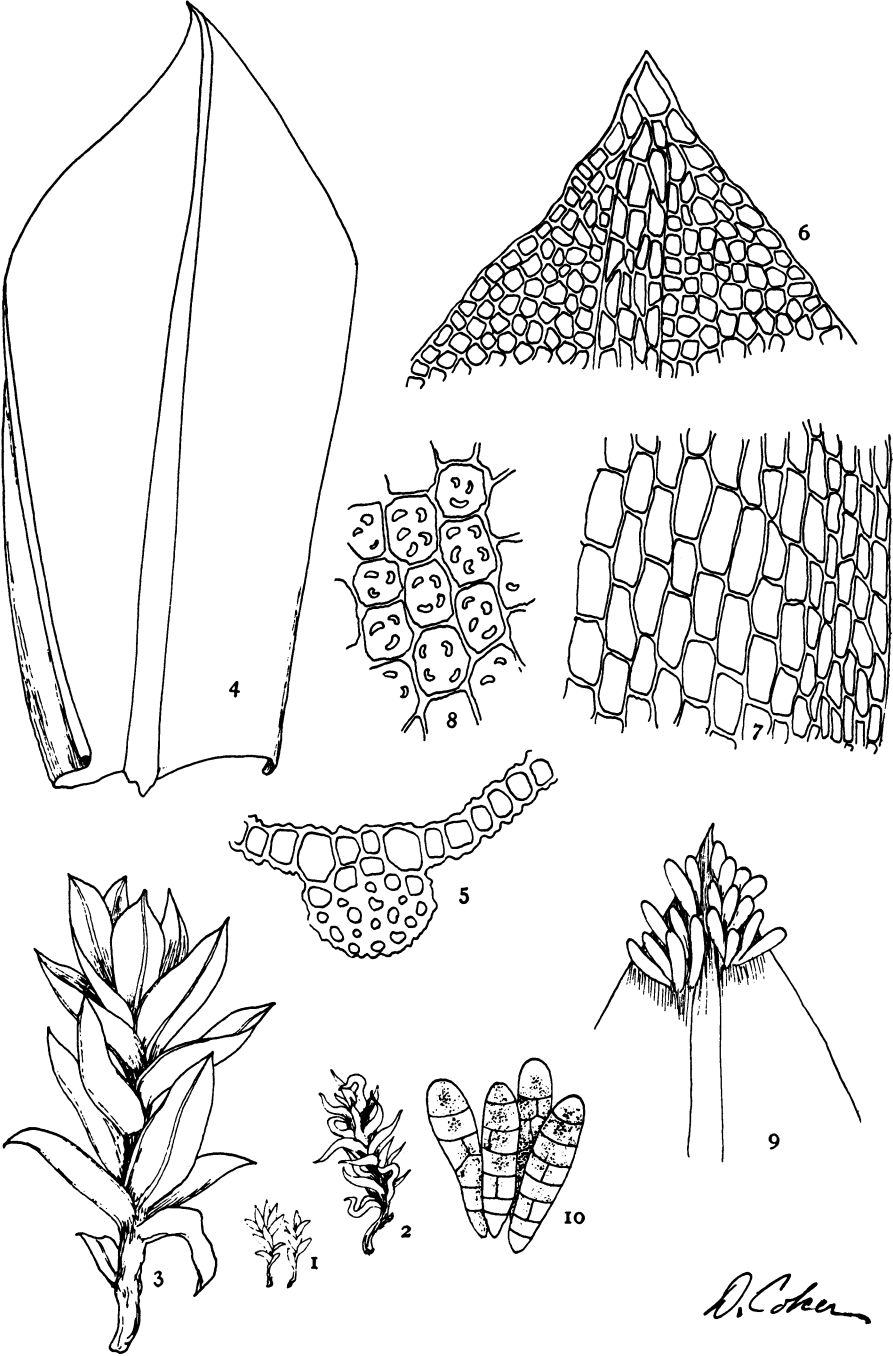
Several species of *Tortula* growing on the bark of trees and reproducing partly or almost entirely by means of propagula are already known, the classic type being *T. papillosa* Wils., widely spread in Europe and also known from the eastern coastal region of North America, as in fact from various parts of the world. From this the species described above differs in a great number of characters, the older species having for example leaves without recurved borders, with excurrent costa, papillose only on dorsal surface, where the number of papillae does not exceed 1 to the cell, the papilla larger, measuring about 10  $\mu$  from end to end of the crescent. The propagula originate mostly from the ventral surface of the costa or the cells immediately adjoining it, they are small, tend to be spherical or slightly oval in shape and are divided in part by oblique planes. The points mentioned are enough to show that there is no very close relation between the two species. *T. latifolia* Bruch is a distinct species sometimes producing propagula similar to those of *T. papillosa*, though apparently mostly from the ventral surface of the leaf blade. It has also a differently shaped leaf, different papillae, and in fact shows no close relationship to our species. The propagula of *T. laevipila* (Brid.) De Not. and the closely related *T. pagorum* (Milde) De Not. are modified leaves having their origin in the stem. Limpricht<sup>3</sup> also assigns cylindrical propagula exceptionally to the leaves of *T. laevipila* and *T. pulvinata* (Jur.) Limpr., which would suggest something more nearly resembling our species. Exception is however taken to this statement by Correns,<sup>4</sup> who was unable to demonstrate such propagula as actually belonging to these species. The statements of Limpricht are however so definite that it seems almost incredible that they are not based upon actual observations. The same statements are also given by Amann and Meylan,<sup>5</sup> whether from original observations or on the authority of Limpricht is not clear. Both species show a long excurrent leaf-costa and are also otherwise entirely distinct from the North Carolina moss. Its relations are in fact not boreal or European at all, but southern. In a specimen of Pringle's *Plantae Mexicanae*, No. 10618, labeled *Fabronia octoblepharis* var. *americana* Card., collected from the bark of *Ipomoea* trees in the first Mexican locality noted above I found a bit of *Tortula* which is clearly related to our species. It shows the same type of propagula, no longer attached, but loose among the plants, while its leaves clearly show the cells from which they had originated. Mr. R. S. Williams identifies this with *T.*

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<sup>3</sup>Rabenhorst, Kryptogamenflora, IV, I, 680, 683. 1888.

<sup>4</sup>Vermehrung der Laubmoose, 78, 84. 1899.

<sup>5</sup>Flore des Mousses de la Suisse, I, 82, 83; II, 120. 1918.



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*parva* Card. from the second Mexican locality above. This identification is undoubtedly correct, except that the specimen of *T. parva* in the herbarium of the New York Botanical Garden is a mixture of a fruiting species without propagula and another with abundant propagula and no fruit.<sup>6</sup> Cardot's description<sup>7</sup> is identifiable with the former; the latter is, so far as I know, undescribed. Mr. Williams does not regard the Mexican plant as of the same species as the North Carolina one, and geographically the case is remarkable, though not without parallel. I can see only slight quantitative differences and do not at present feel justified in calling the Mexican plant a further new species. The Mexican specimens are somewhat smaller in all parts, the leaves less sharply apiculate, the cells very slightly smaller, the papillae rather more prominent and larger, especially on the dorsal leaf-surface, where the crescent-shape is generally displaced by a full ring. The propagula are short, so far as observed, of hardly more than 5 segments, often of less, but otherwise quite like the North Carolina ones. Further collections in the future may show whether these slight differences are of greater value than I have set upon them. For the present the very close relationship between the plants from the two localities is the point demanding emphasis. That the plant has not previously been collected in the United States is remarkable, but our southern states probably still contain undiscovered material of bryological interest and habitually sterile species are easily passed by. So far as my observations go the plant appears to ascend the mountains from the eastern Blue Ridge side. The case was clear at Grandmother Gap, where it had reached about 4000 feet altitude. It also occurred at somewhat lower altitudes down the eastern slope, but appeared to be entirely lacking west of the region immediately about the gap itself. The other two North Carolina localities are, it is true, along a water-system draining to the westward, but Swannanoa Gap is low and I suspect that the plants along the Swannanoa Valley may have arrived by the eastern route. The station at Swannanoa itself was within reach of high water and the plants showed much intermixture of silt; those of the North Fork were probably beyond the reach of floods and showed the longest plants; those of Grandmother Gap were remote from any water course. The propagula were relatively more detached in specimens from the two later collections. Those of the first were already partly detached, but for the greater part held their positions on the leaves. The seasonal development is naturally different in Mexico, and in fact evidently did not correspond in the two localities, as, though both were gathered during the same month of the same year, those of Etzatlan had quite shed their propagula, while those from Cuernavaca had them rather firmly attached in position of origin.

It is to be presumed that the plants are dioicous, but probably do not commonly fruit. *T. papillosa* has never been found in fruit in Europe. Even without fruit the genus of the plants can hardly be regarded as doubtful.

<sup>6</sup>My own set of Pringle's Mexican mosses lacks *T. parva*; a bit of the material of this species from the set in the Farlow herbarium at Harvard University, which I owe to the kindness of Prof. Riddle, shows apparently clear *T. parva* without intermixture of *T. caroliniana*.

<sup>7</sup>Revue Bryologique, XXXVI, 88, 1909.

Since correcting proof of the above I have noted a third Mexican locality for the moss I take to be identical with *Tortula caroliniana*. A few plants are growing with Pringle's 10449 in my set, which is labeled: "*Haplocladium microphyllum* (Sw.) Broth., det. Cardot. Cañada, above Contreras, Federal District. June 7, 1908." The latter is not, however, in my set *Haplocladium microphyllum* either as to genus or species, and the specimen obviously came from the bark of a tree.

The illustrations, for which I am much indebted, were drawn by Miss Dorothy Coker at the New York Botanical Garden.

ITHACA, N. Y.

#### EXPLANATION OF PLATE V

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|------------------------------------|---|
| 1. Plant, moist $\times 2$ .       | 6. Apical part of leaf $\times 200$ .         |
| 2. Plant, dry $\times 4$ .         | 7. Base of leaf, right side $\times 200$ .    |
| 3. Plant, moist $\times 12$ .      | 8. Cells of upper part of leaf $\times 500$ . |
| 4. Leaf $\times 40$ .              | 9. Apex of leaf with propagula $\times 50$ .  |
| 5. Section of costa $\times 360$ . | 10. Propagula $\times 120$ .                  |

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#### SEMATOPHYLLUM SMALLII SP. NOV.

R. S. WILLIAMS

Autoicous, a male flower often at or near the base of the perichaetium; the inner perigonal leaves short, very concave, with usually an irregular lobe on either side of the base of the short, acute, entire point; antheridia 5-6, about 0.125 mm. long, with few or no paraphyses: plants in thin mats with stems mostly 5-6 mm. long, bearing few branches and radicles, the latter chiefly at the base of the stems; stem-leaves mostly nearly straight, widely spreading, more or less complanate or slightly secund, mostly 0.8-1 mm. long, ovate-lanceolate, entire and ecostate; leaf-cells smooth, elongate-rhomboidal to more or less linear with slightly unequally thickened walls, the median cells mostly 5-6  $\mu$  wide by 25-40  $\mu$  long, the alar yellowish, enlarged and inflated; perichaetial leaves variable in length, the longer a little exceeding those of the stem, more or less serrulate with spreading, sometimes recurved teeth below the point and mostly abruptly narrowed to an acute, slightly serrulate point about one third the entire length; seta 6-8 mm. long, smooth; capsule without lid about 0.6 mm. long, inclined or nodding, somewhat obovate, contracted under the mouth when dry, the median exothecal cells nearly square to short-rectangular, the walls slightly thickened at the angles, the stomata, about 25  $\mu$  long, in one row near the base; annulus none; outer peristome with teeth 30  $\mu$  wide at base and 175  $\mu$  long, narrowly furrowed along the median line, cross-striate two thirds up, papillose above; the inner peristome from a basal membrane about one half the height of the teeth, bearing short, solid segments and solitary, papillose cilia; lid about as long as the rest of the capsule, conical, with a slender, oblique beak; spores minutely punctate, about 12  $\mu$  in diameter.